

## REMARKS

Claims 1, 4-6, and 9-37 were previously pending, of which claims 13-34 have been withdrawn. Claims 2, 3, 7 and 8 have been cancelled without prejudice. By this amendment, claims 6, 21, and 26 are currently amended. Also by this amendment, no claims have been added or cancelled. As a result, claims 1, 4-6, and 9-37 remain pending, of which claims 13-34 have been withdrawn from consideration. No new matter has been added.

Claim 6 is currently amended to correct five obvious typographical errors in the spelling of “diisocyanate”.

Similarly, withdrawn claim 21 is currently amended to correct five obvious typographical errors in the spelling of “diisocyanate”.

Withdrawn claim 26 is currently amended to correct five obvious typographical errors in the spelling of “diisocyanate” and to correct an obvious typographical error in the spelling of “polyphenylisocyanate”.

Applicant acknowledges that the Examiner has withdrawn the previous objection to claim 3 and the previous rejection of claims 1-12 and 35-37 under 35 U.S.C. § 102(e) as being anticipated by Ley et al. (WO 03/006151).

### **Response to Rejection Under 35 U.S.C. § 112, First Paragraph**

The Examiner newly rejected claim 1 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. In particular, the Examiner asserted that the recitation “the transition metal catalyst and the ligand are discrete” in claim 1 is not properly described in the application as filed. According to the Examiner, “There is no [sic] any description for the catalyst and ligands as being discrete entities in the micro-encapsulated system.”

Applicant respectfully traverses the rejection, for at least the following reasons. The written description requirement can be satisfied without an *in haec verba* disclosure in the specification of what is claimed. MPEP 2163.02. Rather, a proper test for sufficiency of support in an application is whether the disclosure of the application reasonably conveys to the skilled artisan that the inventor had possession of the invention at the time of the filing date. *See, e.g.,*

*In re Gosteli*, 872 F.2d 1008, 1012 (Fed. Cir. 1989); *Vas-Cath v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991); *Pfaff v. Wells Elecs. , Inc.*, 525 U.S. 55, 68 (1998).

In respect of the catalyst and ligand being discrete, Applicant previously pointed out the location of support for the phrase in question. In particular, Applicant previously pointed the Examiner's attention to page 1, lines 7 to 9, which state that microencapsulation of the catalyst takes place in the presence of the ligand; as well as page 9, lines 31 to 32, which state that the ligand is encapsulated along with the catalyst. Furthermore, throughout the description there is reference to microencapsulation of the catalyst and the ligand, e.g., page 11, line 1; page 12, line 35; and page 14, lines 4 to 9. In addition, Examples 7 to 24 refer to co-encapsulation of the catalyst and ligand, or post-adsorption of catalyst or ligand. As was argued in the previous response, a person of ordinary skill would understand from the specification that the catalyst and the ligand are discrete in the product formed by the interfacial polymerization process. The pending claims are directed to such microencapsulated catalyst-ligand complexes where the catalysts and ligands are encapsulated as discrete entities, i.e., they do not form a conventional complex wherein the catalyst is bound to the ligand.

In addition to the foregoing, Applicant wishes to point out the following in response to the Examiner's assertion of failure to comply with the written description requirement in connection with the phrase "the transition metal catalyst and the ligand encapsulated within the permeable polymer microcapsule shell are discrete" recited in claim 1.

Examples 12 to 17 of the application disclose the preparation of a catalyst system having microencapsulated palladium acetate with post-adsorbed triphenylphosphine (PPh<sub>3</sub>). Additionally, Example 18 discloses the preparation of a catalyst-ligand system comprising microencapsulated triphenylphosphine with post-adsorbed palladium acetate. Hence it is submitted that these examples do disclose the synthesis of the claimed microencapsulated catalyst-ligand system of claim 1. In other words, these examples do serve as written disclosures of the formation of an encapsulated catalyst-ligand system where the catalyst and ligand components are clearly discrete within the microcapsule.

Further evidence may be found in the specification on page 32, lines 14 to 19, where it is disclosed that an induction period is seen in the reaction of the microencapsulated catalyst-ligand system performed through post-addition of phosphine to a palladium EnCat system (from

Examples 12 to 17). The rationale for this is that time is required for diffusion of ligand through the matrix to form an active complex with the metal sites. This implies that the two components present in the microencapsulated catalyst-ligand system of the invention are discrete as synthesized.

Furthermore, Applicant wishes to direct the Examiner's attention to Examples 7 and 9 in the description. These examples disclose the preparation of a microencapsulated catalyst-ligand system comprising microencapsulated palladium acetate with co-encapsulated triphenylphosphine or tri-*o*-tolyl phosphine. Again, these examples represent microencapsulated catalyst-ligand systems in which a conventional complex is not formed. In other words the catalyst and ligand components remain as discrete entities within the microcapsule.

As yet further evidence in support of there being adequate written description, Applicant also points out the following:

During preparation of the microencapsulated catalyst-ligand system disclosed in Examples 7 and 9, for example, a substoichiometric amount of phosphine is added relative to the amount of palladium added. The molar ratio of palladium to phosphine is disclosed to be 1:0.5. A conventional palladium-phosphine complex requires excess phosphine to be present relative to the palladium, i.e., a molar ratio of phosphine to palladium in excess of 1:1. For example, tetrakis(triphenyl)phosphine palladium complex having the formula  $\text{Pd}(\text{PPh}_3)_4$  necessarily requires a four-fold molar excess of phosphine ligand to palladium. The disclosure of catalyst-ligand systems of the invention in which the ratio of palladium to phosphine is disclosed to be 1:0.5 alone implies that the palladium can, at best, only be partially complexed with the phosphine ligand. This point is further disclosed in the specification in Examples 19 and 22, for example, where the molar ratio of palladium to phosphine is disclosed as 1:0.5 and 1:0.82, respectively.

Applicant would also like to point out the following observations concerning the microencapsulated catalyst-ligand systems according to the instant invention, which observations can be presented in the form of a declaration if such would be useful or necessary:

1. Cross-sectional images of catalyst-ligand microencapsulated beads according to the invention show that palladium and phosphine are distributed throughout. There is no clear association of the phosphine only with palladium. In other words, both the palladium and the phosphine ligand are distributed randomly throughout the microcapsule and are not necessarily

associated with each other.

2. The oxidation state of the palladium in catalyst-ligand microencapsulated beads according to the invention has been investigated in various experiments. The palladium is added as palladium (II) acetate in which the palladium has an oxidation state of two. In a conventional palladium-phosphine complex, such as the above-mentioned tetrakis(triphenyl)phosphine palladium complex, the palladium is in an oxidation state of zero. X-ray photoelectron spectroscopy (XPS) has been used to study the oxidation state of palladium in a number of the microencapsulated catalyst-ligand systems of the present invention. The response from the electronic orbitals in different oxidation state metals gives different peaks in this technique and thus provides information as to the oxidation state of the palladium in the microencapsulated beads. Data from such studies demonstrated that most of the palladium in the phosphine-containing microencapsulated catalyst-ligand systems according to the invention is present as palladium (II) and not present as palladium (0); in other words, the palladium is not present in a fully phosphine-coordinated conventional palladium-phosphine complex which would contain palladium in an oxidation state of zero but instead is present in the form of the palladium acetate salt. This data therefore clearly demonstrates that palladium present in these microencapsulated catalyst-ligand systems of the present invention is in oxidation state of two, from which it follows that palladium is not complexed to phosphine in these microencapsulated catalyst-ligand systems. Consequently, it is correct to say that the transition metal catalyst and the ligand encapsulated within the permeable polymer microcapsule shell are discrete as set forth in claim 1. Not only does the specification confirm this point, but the skilled person would immediately appreciate that this is the case both from the context of the specification and by performing the above-mentioned XPS experiment.

In view of the above, it is submitted that the application does indeed disclose the feature that the transition metal catalyst and the ligand are discrete entities within the claimed micro-encapsulated catalyst-ligand system, such that the disclosure of the application reasonably conveys to a skilled artisan that the inventor had possession of the invention as of the filing date. Accordingly, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of claim 1 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement.

### **Response to Rejections Under 35 U.S.C. § 102**

Claims 1, 4-6, 9-12, and 35-37 are rejected under 35 U.S.C. § 102(e) as being anticipated by Ley *et al.* (WO 03/006151).

Applicant respectfully traverses the rejection, for at least the following reasons. In making this novelty rejection, the Examiner evidently accorded no weight to the limitation “the transition metal catalyst and the ligand encapsulated within the permeable polymer microcapsule shell are discrete” recited in claim 1, consistent with the concurrent rejection of that claim made under 35 U.S.C. § 112, first paragraph (*supra*).

However, having established that such limitation is in fact adequately disclosed in the specification, it becomes immediately apparent that novelty of the instant invention over Ley *et al.* has also been established. Because Let *et al.* does not teach that the transition metal catalyst and the ligand encapsulated within the permeable polymer microcapsule shell are discrete, Ley *et al.* does not disclose each and every element of claim 1, as would be required for anticipation. Claims 4-6, 9-12, and 35-37 all depend, directly or indirectly, from claim 1. Accordingly, Ley *et al.* does not anticipate any of claims 1, 4-6, 9-12, and 35-37.

In view of the arguments presented above, Applicant respectfully requests the Examiner to reconsider and withdraw the rejection of claims 1, 4-6, 9-12, and 35-37 under 35 U.S.C. § 102(e) as allegedly being anticipated by Ley *et al.*

## CONCLUSION

In light of the foregoing amendments and remarks, it is respectfully submitted that the pending claims are in condition for allowance. Reconsideration and allowance of the pending claims is respectfully solicited. If a telephone interview would be helpful, the Examiner is invited to call the undersigned at 617-832-1000.

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